

Event Studies: What They Are and Why They Matter

An Honors Thesis (Honors 499)

by

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Abstract:

An Event study is primarily a statistical analysis technique that attempts to glean hidden information from accessible data. The key elements are: selecting an event window (often a release of information) and devising a method for predicting what the data (often stock value) would have been in the absence of the studied event – a simplified example might be the effect of a new product announcement on a company's stock price, using the average performance trend of competitors and/or recent performance trend of the company to project what the price would have been without the announcement (event). This paper discusses the basics of the methodology and reviews some of the documented challenges in applying it to complex real-world cases. An event study from the literature (introduction of the iPhone in the US) is reviewed and some suggestions are made on how to be an informed consumer of the potentially unique and valuable information that event study methodology can yield.

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If someone had told you in 1945 that they could tell you the key ingredients in the then top secret hydrogen bomb, you probably wouldn't have believed them. But Armen Alchian did just that. In 1945 renowned economist Armen Alchian, who had no physics or science background, was able to identify the top-secret chemical ingredients in the thermonuclear (hydrogen) bomb using only publicly available economic data.

Armen Alchian's work on the hydrogen bomb may have been one of the first economic event studies ever conducted. Alchian collected stock price data of a number of companies that sold the chemical ingredients that were likely components of the h-bomb and was able to identify an abnormal increase in stock price for one company and was thus able to identify the ingredient that was being used in the h-bomb. Unfortunately Alchian's memo on the topic was classified (he was employed at the government think tank RAND when he completed the work) and no declassified copies have been recovered, so no concrete evidence of Alchian's work exists. Alchian was finally persuaded to include a short description of his research in his article *Principles of Professional Advancement* in 1996, which gives us what insight we have into the study (McChesney, 2009).

An economist in the 1940s was able to use stock prices and some publicly available industry data in order to decipher the ingredients in the h-bomb; clearly this was a significant accomplishment. How was this possible? As mentioned earlier Alchian used what would now be identified as the elements of an event study to make this discovery. This example gives us a great idea of the power of event studies and how much information can really be derived from public stock information.

So what exactly is an event study? According to NASDAQ.com an event study is “A statistical study that examines how the release of information affects prices at a particular time.” (2010) Kara Reynolds of American University states “Economists often use event study methodology to evaluate the impact of new regulations on firms”(2006). Alchian’s study used financial data (stock prices) to infer technical data (chemical ingredients in the thermonuclear bomb).

Based on these observations, we can define some general characteristics of event studies:

- 1) The goal is generally to isolate information that is not readily obtained directly, either because it is unavailable (H-bomb) or because it is obscured by complex interactions within the system being studied (stock pricing, impact of regulation)
- 2) The technical approach is to find direct (visible and quantifiable) variables that will exhibit a strong relationship with the indirect (difficult, impractical, or impossible to obtain) information. As a trivial example, let’s suppose we would like to know where our neighbor works (further we are too antisocial to just ask and too lazy to follow him).
 - a. First, we could gather information on their arrival and departure time each day to imply travel time and create a likely region for the workplace.
 - b. We could then improve this by overlaying traffic and weather conditions within the “doughnut” over many days and correlating that with shorter or longer travel times.

- c. We could attempt to factor in other observable data to fine-tune our prediction: for example, the automobile driven or clothing worn.

3) The use of “prior probability” estimates in order to estimate the indirect information based upon the observed information. For example, once we have a good idea where our neighbor works and what the time pattern looks like, we might be able to imply an increase in sales at the local tavern based on the fact that it always takes an hour longer than usual (prior probability) to get home on Friday.

In order to develop a deeper understanding of the techniques and information that make up event studies we will first start with a brief history of the development of event studies, then we will discuss some of the most landmark event studies and what makes them such, and finally we will discuss event studies today and in the future and why they matter to you.

There is some debate between scholars as to what constitutes the first event study. Alchian’s work from the 1940s is some of this early body of work. James Dolley published work in 1933, where he examined how stock splits had affected firm values, which could be argued to be an early version of an event study (MacKinlay, 1997). Other scholars argue that the first applications of the event study are not evident until the work of Ball and Brown in 1968 and Fama, Fisher, Jensen, and Roll in 1969 (Henderson, Jr., 2002). Ball and Brown were considering the impact of a company’s annual earnings announcements and FFJR considered market efficiency (in other words how quickly and correctly the market reacted to new

information) (Henderson, Jr., 2002). It was these two studies that helped develop the framework steps involved in most event studies (Henderson, Jr., 2002).

According to Henderson of the University of Cincinnati, there are five basic steps to an event study as carried out by Ball and Brown and FFJR (2002):

- 1) "Define the date upon which the market would have received the news."
 - a. Pick the information to look at (for instance earnings announcements) and figure out when the public (those people paying attention to this type of information) would have gotten access to this news.
- 2) "Characterize the returns of the individual companies in the absence of this news."
 - a. Get an idea of what the stock prices would have looked without the impact of the information
- 3) "Measure the difference between observed returns and "no-news" returns for each firm – the abnormal returns."
 - a. Find the difference between the value with the information and the value estimates (from step 2) in the absence of the information (the difference between the two equals the abnormal returns)
- 4) "Aggregate the abnormal returns across firms and across time."
 - a. Look at the abnormal returns from step 3 and compare them to changes in company returns over time, and compare them to returns from other companies in the industry to see if they are independently abnormal or if they could have been caused by

other market forces (for example a growing or shrinking economy).

5) "Statistically test the aggregated returns to determine whether the abnormal returns are significant and, if so, for how long."

- a. Figure out whether the returns we identified in steps 3 and 4 to be out of the ordinary are significant enough to affect decisions made by stockholders and if it is significant how long it continues to affect stockholders decisions.

While these steps almost certainly over-simplify what is an exceedingly complex task, they do give us a better idea of how one might go about actually pursuing an event study.

Since the 1960s the basic framework for event studies has remained mostly unchanged; most of the important developments involve accounting for extraneous factors that could impact stock value such as dividend increases, general movements within the economy, and many of the other factors that complicate our ability to predict the future value of companies (MacKinlay, 1997). Our economy is exceedingly complex and is acted upon by a huge number of forces from the monetary policy of the Federal Reserve to consumer preferences. This complexity continues to ensure that event studies are unlikely to ever be an exact science but rather a series of best estimates. However these estimates can still give us a reasonable picture of what the release of certain information could do to the value of various companies.

There are a number of uses for the information that we can gather from an event study. As discussed earlier event studies are often used to understand how new regulations might affect firms, but they can also be used by firms to understand and predict how certain information releases, such as announcing a stock split, can affect the company. Event studies are not however restrained to these popular models as we saw with Alchian's work; event studies can be put to some pretty interesting uses when the right adaptations are made. We will focus on the more popular uses for event studies in our discussion as the majority of examples and research come from these areas.

Event studies can help regulatory bodies understand how potential legislation or regulation change might affect the markets, and can also show us what investors think about a new regulations. Event studies of regulations involve examining the changes in value of the firm in question over the course of the "event window" (Lamdin, 2001). The "event window" starts when the regulation is first proposed and continues until the regulation is implemented or rejected (Lamdin, 2001). Since the event window for a regulatory change is so large often the window will contain multiple "event periods" which are times where the likelihood of the regulation being enacted changed in some significant manner (Lamdin, 2001). These significant changes in the probability of enactment serve as news in the event study (Lamdin, 2001). Event studies can only be completed on historical data, but as soon as the regulation is proposed and the market learns this news it will react, the data generated by this reaction can give us an idea of how the market thinks this regulation will affect markets. This information could then be used to support or

discourage the passing of that regulation. Event studies can also give us general trends about how value of firms is affected by certain types of regulation trends. For example through event studies we might be able to identify a trend where the market looks favorably (firms increase in value) when there are moves toward deregulation.

As with any predictive tool there are some flaws in the use of event studies to predict the effect of changes in regulation. One of the biggest of the issues that arise develops from the difference between expectations and reality. Since event studies are based on changes in firm value, they depend on investor's reactions to news. Investor expectations of how a regulation will affect an industry or firm value often does not perfectly reflect how a regulation actually affects the firm value in the long run. Many event studies focus on current data surrounding the event window, which can sometimes lead to this difference between expectations and reality being ignored or not fully explored (Lamdin, 2001). If we leave this information out of our event studies then we will not get a complete picture of the actual effect that regulatory changes can have on company value (Lamdin, 2001).

Event studies can also be used to tell us how other important announcements affect firm value. These announcements can include stock splits, earnings announcements, mergers, acquisitions, or any other major business information release. The information can then be used by firms and investors to understand how the market might react to these types of announcements in the future. A number of studies have been done to look at how stock price is affected by the announcement of stock splits. Mathematically following a 2-1 stock split there should be twice as

many shares outstanding and they should be worth exactly half of the previous stock price. This would leave the firm valued at the same amount; for instance if the stock was trading at \$100 with 100 shares outstanding and a 2-1 stock split occurred theory says that there should now be 200 shares outstanding at \$50/share. However there is significant evidence that stock values do not remain constant following stock splits, this evidence comes in the form of event studies such as that conducted by Peter Kimball and D. Robert Papera in 1964. In their study Kimball and Papera concluded “the stocks which split out-performed the control stocks by a substantial majority.”(1964) Between this and other studies the fact that stock price will see an increase following the announcement of a stock split is now commonly found in finance textbooks.

Event studies have been applied to a number of other unusual circumstances. In 2007, Martin Wienand conducted an event study of the FIFA World Cup sponsorships and whether these sponsorships created value for the stockholder. In his research Wienand was able to determine “the above analysis reveals that positive abnormal returns accrue to firms announcing sponsorship of the FIFA World Cup.” (2007) This type of study has large implications because it takes the event study out of the realms of theoretical economics or finance. Most people would probably agree that deciding to sponsor a major event such as the FIFA World Cup would have a lot to do with the marketing department, and not as much to do with the finance department (except for being responsible for securing the funds to fulfill the sponsorship). This is just one of the many examples of how event studies can apply outside of the economics and finance fields.

In 2006 professors at Harvard and Carnegie Mellon conducted an event study of the costs associated with privacy breaches (Acquisti, Friedman & Telang). The professors wished to discover if the release of personal information due to the failure of a security protocol would have significant impact on stockholder wealth (Acquisti, Friedman & Telang, 2006). In their study they found that when a security breach was announced there was a significant negative impact on stock value (Acquisti, Friedman & Telang, 2006). This kind of information is critical to firms because it helps to indicate what value the markets place on information security. This can have significant impact on what kind of security protocols the company chooses to implement which can affect the information systems they choose to use. It also poses potential ethical dilemmas for companies in terms of disclosure, as they must balance the responsibilities to their customers with the responsibilities to their owners. It can be difficult to determine the difference between an actual breach and a potential breach. Senior management needs this type of information in order to establish reasonable protocols that balance the interests of all stakeholders. This type of information could be difficult to quantify at all without event study methodology.

Carrying out a high-quality event study is a significant undertaking requiring a high degree of technical skill (and a lot of time); few people need to master the fine detail. However, potential consumers of this information exist in all walks of life. Understanding the general structure of event studies as well as their limitations would be of great benefit to these potential consumers and requires only a fraction of the sector-specific knowledge and technical skills required to perform the study.

In order for consumers to be able to evaluate the quality of the results, they must understand some of the potential pitfalls and complications in event studies that can lead to erroneous or misleading results. We will examine the five steps of an event study that were identified earlier and discuss some of the complications and possible affects that each could have on the outcome of the study.

The first step, “Define the date upon which the market would have received the news.” is quite possibly the most problematic element of any event study, the definition of the “event window”. This step is also one of the most critical, because it affects every other step and almost singly determines the veracity of the conclusion. Since we wish to evaluate the specific impacts of an individual change, such as the impact the release of the iPhone had on telecommunication companies around the world (Terada, 2012), the event window must be carefully selected to isolate just that event from the hundreds of others that were likely occurring at the same time. This need for isolation is often extremely challenging in modern markets because with the advent of the information age, information flow has increased to the point that large amounts of very diverse data is often release simultaneously from a host of sources. This creates issues like whether the stock price changed because a new regulation was finally put in place or because an analyst downgraded the stock or because the CEO just announced a retirement or any number of other similar releases that could have happened at the same time. To further complicate matters because of the availability of information, often markets anticipate information releases, which can skew data. This is especially the case for regulatory change, because regulations rarely if ever are completely unexpected, so we must consider

what we identify as information release and with regulation this often involves defining a rather broad event window. When we expand the event window to incorporate this information trickle, we again encounter the confounding variables of events external to our study skewing our results.

There are of course ways to mitigate the effects of external events on our results, and thus isolate our event using other data rather than attempting to select the event window is such a way as to ensure no confounding variables. This ties in somewhat with step four “aggregate the abnormal returns across firms and across time”. Cross industry analysis might help in isolating an event that only affects one company, such as the release of a particular product, but if (as is often the case with regulation) an event affects the entire industry, it becomes nearly impossible to use companies within that industry for controls (sources of isolating information). However the markets do provide us with other information we can use in these cases to assist in isolating events. We can employ what Snowberg, Wolfers, and Zitzewitz identify in their 2010 paper as prediction markets to help us create this isolation. Prediction (and futures) markets can help us identify what the market believes to be the probability that an event (such as the election of a presidential candidate) will occur. Using the changes in these probabilities and the changes in value in the market, we can identify the relationship between the two and thus isolate the impact of the event from the impact of extraneous events (Snowberg, Wolfers, & Zitzewitz, 2010).

Steps 1 and 4 and their complexities have been addressed which leaves us with steps 2,3, and 5. Step 3 for the most part involves a mathematical calculation

with little call for judgment on the part of the researcher, and thus does not introduce much risk into the outcome of the study. Step 5 is mostly dependent on the application of standard statistical procedures and as such we will assume that after determining that the researcher(s) are competent in this area, this step also introduces minimal risk into the outcome. This leaves us to address step 2, “characterize the returns of the individual companies in the absence of this news”. This step calls for speculation from the researcher as to how the company’s stock might have been valued without the event occurring. This would seem simple at first glance because the stock prices would theoretically remain the same, unfortunately however the event is not occurring in a vacuum, which brings us back to many of the issues we identified with steps 1 and 4. We must predict the price of the stock in the presence of all other events excluding the one we are studying. This is another place where prediction markets can help us identify the relationship between the event we are studying and the values we are trying to predict, by identifying this relationship we can attribute other changes in firm value to pressures outside the event being studied. We can then apply this information to allow us to make a well-reasoned and evidenced prediction of what the value might have been in the absence of the event.

Event studies can be found throughout the business world and the potential importance to business is immense but also relatively clear, event studies provide information and in business information is nearly invaluable. Less clear are the advantages of event studies to the individual consumer. But when it is really considered, every individual consumer is a bit like a micro business. We each have

revenues in the form of income from selling our services as an employee, and expenses that we incur in order to generate those revenues. We complete our personal balance sheets with debt and even a form of personal equity that we develop through our education and skill development. So if every individual operates as this sort of micro business it stands to reason that information should prove just as valuable to the individual person as it is to what we traditionally view as a business. Information is only as valuable as our understanding of it and in so far as we use that information to make our decisions. Therefore how the individual can develop an understanding and apply the information found in event studies bears investigating.

In business we only pursue those opportunities that generate a return greater than the required investment. Without the understanding and use of event studies the information we derive from them would involve an extremely costly investment by each individual to obtain that same information. Event studies provide the individual without the technical knowledge to obtain cheaper information, and by decreasing the cost, the investment becomes such that we can generate returns greater than the required investment. We will examine some of the results from event studies that might prove useful to the average consumer.

The first study involves something we are all at least somewhat familiar with, the iPhone. The introduction of the iPhone led to a significant shift in the mobile phone industry; from a time when only business people had BlackBerry devices to an explosion of the smartphone era, where everyone has a smartphone and it is sometimes difficult to find a phone only having basic calling and texting features. So

it would seem to reason that this would have a significant financial impact on companies in the industry. Without exploring any research on the subject it would seem that the most reasonable result of this shift would be an increase in value for those companies who were early adopters. AT&T was the exclusive carrier for the iPhone when it was released, so it would seem that we would see an upswing in the value of AT&T with the popularity of the first iPhone. However a researcher at University of Tokyo conducted an event study of the effects of the iPhone on company value in the USA, Europe, and Japan and this was not the conclusion they reached (Terada, 2012). Terada actually discovered that the release of the iPhone had little to no impact on the value of the firms that carried the iPhone (2010). This is a surprising result, but even more surprising is the fact that in his study he also found that the release of the iPhone actually decreased the value of firms not carrying the iPhone (Terada, 2012).

Without information from this study, our expectations were not only incorrect, but we might have even ignored or been ignorant of the effects on other companies, which is also valuable information. As an individual in the market, this information could prove very useful. When the iPhone was released many people saw it as a game changer in the industry. If you were operating under what seems to be the logical conclusions (without the information provided by the event study) you might decide it was a good time to invest in AT&T. It would seem that AT&T having such a huge first mover advantage would lead to a significant increase in value. However, when we consider the results of the event study we can see that AT&T saw very little change in value (Terada, 2012). We see that rather the release

of the iPhone on an exclusive carrier impacted the other carriers (Terada, 2012). This might indicate that if another game changing technology is released in this industry, one should divest from the companies lacking the new technology and buy back into those companies at a lower price at a later date. The study also looked at what happened to the value of Apple over the same event window, and discovered a significant increase in its value (Terada, 2012). This result might indicate that with the release of new telecommunications technology manufacturers see most of the gains where the service companies see very little impact on their value that can be directly linked to a specific piece of hardware.

We can't make all of our decisions based on a single study, but this information combined with other information provided by the markets could give an investor a better idea of how new (revolutionary) hardware can affect the telecommunications industry. If next year Samsung were to release the next game changer in the phone market that had an exclusive AT&T contract, we could use the information gleaned from the iPhone study to make better decisions about investing. From the study we learned that to generate the highest return you would be better off investing in Samsung, selling Verizon and Sprint, and remaining neutral as to AT&T. Without the study information, one might decide to invest in AT&T, and Samsung, and remaining neutral to Verizon and Sprint.

This study is just one example of the information that can be gathered from event studies. The information from this study gives us some ideas as to what to expect and decisions we can make as investors in a specific industry. Other event studies provide us with information about general market tendencies and trends. If

we can develop a better understanding of these trends and how the market reacts to certain events such as elections or earnings announcements, we can better develop our investment strategies.

Information that we can gather from studies such as Kimball and Papera 1964 study on stock splits can help us as the individual investor to make important decisions. From this and many other studies on stock splits it is now an accepted principle in finance that in general there will be a short term increase in the value of the stock immediately following the announcement of a stock split. So why does this matter as an individual investor? Well as an individual investor, if we were looking for a good time to sell out part of our share in the company (for whatever reason), we know that selling after the impact of a stock split could increase our return. This sort of information may not make a large dollar difference for an individual investor on any one transaction, but a multitude of this kind of information as a component of an investor's strategy over time could lead to a rather substantial return. If for instance the use of this information saved you \$1 per year from when you started investing at 25 until you stopped investing at 90, at the average market return of 10%, you would have created approximately \$4,900 of additional wealth.

Event studies provide us with more efficient ways of understanding what would otherwise be vast and likely incomprehensible amounts of raw data. Event studies allow us to get a better understanding of our past in order to better plan for the future. From the use of event studies we have come to understand how certain information releases affect the stock market and the value of the announcing firm or

firms. This information can provide an advantage to companies in timing of announcements, and a number of other aspects.

The individual investor can also benefit from the knowledge that is provided by an event study. Event studies can provide the individual investor with a way to access information that would otherwise be too costly for them to obtain. The investor will still need to invest some resources (time) in order to test the reliability of the study. This is where knowledge of how event studies are conducted and the related issues can help the average investor evaluate the strength of the conclusions drawn in the study. The investor should carefully and skeptically examine the methodology used to select the event and the event window. The investor should also consider other information used (or not) to isolate the effects of the event from the effect of other simultaneous events. An investor should keep in mind the reliability of the predictive data used (if it is used) as well as how strongly correlated that data is with the information the study seeks to find; if the study makes use of only loosely correlated data, then the results are much more likely to be inaccurate. The investor should also ascertain the competence of the researcher; we will assume that if the researcher is competent the mathematical calculations will be executed correctly. As an investor you should keep in mind that while competence and additional data are important, if the event window is incorrectly selected the entire study loses value, even if every other element is flawless. Errors in selecting the event window can cause what should be a positive result to produce a negative result and vice versa, they can cause results that should be neutral to move in either direction. Assuming that the investor can ascertain that the study

can be relied upon, the information obtained can have a significant impact on increasing the investor's personal wealth. Event studies have been used to investigate a diverse range of data. In the 1940-2000 event studies were used to find information ranging from the affect of stock splits on firm value to the chemical makeup of the thermonuclear bomb. In recent years researchers such as Snowberg, Wolfers, and Zitzewitz have been able to apply event study methodology to policy changes including understanding how elections can affect the S&P 500 (2010). Terada was able to map the effect that the release of a revolutionary technology had on the telecommunications industry (2012). In 2007 a researcher was able to demonstrate a significant connection between sponsorship of the FIFA World Cup and increase in firm value (Wienand). This is just the beginning of a lengthy list of event studies that have be conducted since their advent in the mid-to-late 90's, and event studies continue to be conducted and will continue to develop to become an even better tool for understanding and providing information.

Event studies create a bridge between those with the technical knowledge to process and compile the data and those that can use the information. They help to lower the cost of information and therefore help create more economic wealth for society. Event studies have applications across an immense number of fields and industries and with a basic understanding even you can take advantage of event studies.

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